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**PATENT APPLICATION**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Tatsuya FUKUNAGA

Group Art Unit: 2817

Application No.: 10/733,349

Examiner: S. Ham

Filed: December 12, 2003

Docket No.: 118003

For: RF MODULE AND METHOD FOR ARRANGING THROUGH HOLES IN RF  
MODULE

**SUPPLEMENTAL RESPONSE UNDER 37 C.F.R. §1.111**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

In reply to the February 10, 2005 Office Action, further to the May 10, 2005 Amendment, and further to the May 24, 2005 personal interview, please consider the following supplemental remarks.

Claims 1-4 and 6-8 are pending in this application.

The courtesies extended to Applicant's representative by Examiner Ham at the interview held May 24, 2005, are appreciated. The reasons presented at the interview as warranting favorable action are incorporated into the remarks below and constitute Applicant's record of the interview.

In claim 1, the formula at the end of the claim incorporates the formula originally recited in dependent claim 2. Claim 1 also recites that, in the RF module recited therein, the propagation region of electromagnetic wave is the region surrounded by the ground electrodes facing each other in the plurality of through holes.

On pages 2-3, the Office Action rejects claims 1, 3, 5-7 and 9 under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,788,918 to Saitoh et al. (hereinafter "Saitoh"). On page 3, the Office Action rejects claims 1, 3, 5-7 and 9 under 35 U.S.C. §102(b) as being anticipated by Uchimura et al. (Development of a "Laminated Waveguide") (hereinafter "Uchimura"). On pages 3-4, the Office Action rejects claims 1, 3 and 5-9 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,380,825 to Takenoshita et al. (hereinafter "Takenoshita"). On page 5, the Office Action rejects claims 2, 4, 5 and 7 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,356,172 to Koivisto et al. (hereinafter "Koivisto"). On pages 5-6, the Office Action rejects claim 4 under 35 U.S.C. §103(a) as being unpatentable over Saitoh, Uchimura or Takenoshita in view of U.S. Patent No. 5,208,561 to Delestre et al. (hereinafter "Delestre"). On pages 6-7, the Office Action rejects claims 10-12 under 35 U.S.C. §102(b) as being anticipated by, or, in the alternative, under 35 U.S.C. §103(a) as obvious over Takenoshita. These rejections are respectfully traversed.

The subject matter recited in claims 1-4 and 6-8 optimizes arrangement of the through holes according to the relation between the interval  $d$  between centers of neighboring through holes and the radius  $r$  when the propagation region of electromagnetic waves is formed with the ground electrodes facing each other and the plurality of through holes. By such an optimization, the subject matter recited in claims 1-4 and 6-8 can propagate electromagnetic waves effectively irrespective of a signal wavelength and the like.

In the personal interview held May 24, Examiner Ham requested additional remarks regarding the optimization of the relationship between the interval  $d$  between centers of neighboring through holes and the radius  $r$  recited in claim 1.

The reasons for the optimization of the recited range of

$$3.6r < d < 4.0r \dots (A-1)$$

are described in the specification and drawings. The optimization of the recited range is shown in FIG. 11 and the lowest paragraph of page 17. The optimization of the recited range is also shown in FIG. 20 and the third and fourth paragraphs in page 24.

As a parameter showing performance of a resonator, no-load  $Q$  is known. In FIG. 20, if attenuation from -25 dB to -30 dB is obtained, no-load  $Q$  of an ideal resonator is obtained. When the numerical range of  $d/r$  which satisfies -25 dB to -30 dB is calculated from the attenuation in FIG. 11 and the relation of  $d/r$ , the numerical value of  $3.6r < d < 4.0r$  is obtained. In this numerical range, the performance same as the ideal resonator is achieved.

In the subject matter recited in claims 1-4 and 6-8, the relation between the radius  $r$  of the through holes and an interval  $d$  between centers of neighboring through holes is defined as  $3.6r < d < 4.0r \dots (A - 1)$ . Saitoh discloses  $r = 0.05$  mm,  $d = 0.4$  mm, and  $d = 8r$ . Uchimura discloses  $r = 0.05$  mm,  $d = 0.26$  or  $0.52$  mm, and  $d = 5.2r$  or  $10.4r$ . Takenoshita discloses  $r = 0.08$  mm,  $d = 1.58$  mm,  $r = 0.05$  mm,  $d = 0.25$  mm,  $d = 19.75r$ , and  $d = 5r$ .

Therefore, by limiting the range recited in claims 1-4 and 6-8, the rejection based on the citations above is overcome. In the citations, the relation between  $r$  and  $d$  is not included within the range of the formula (A - 1) recited in claims 1-4 and 6-8, and thus the citations do not disclose, teach or suggest the subject matter recited in claims 1-4 and 6-8.

Further, Koivisto discloses a cavity resonator (10) and connecting the cavity resonator (10) and an integrated circuit (15) via an excitation coupling (18). Moreover, Koivisto discloses forming vias (19) in predetermined intervals along the surrounding of the excitation coupling (18). In Koivisto, a signal is delivered to the cavity resonator (10) via the excitation coupling (18), and the structure of the transmission line is completely different from the structure of the waveguide recited in claims 1-4 and 6-8, where the electromagnetic wave propagates through the region surrounded by the ground electrodes facing each other and the through holes bringing the ground electrodes into conduction. Further, Koivisto does

not disclose, teach or suggest functioning the vias as a conductive wall to prevent leakage of the electromagnetic wave. The subject matter recited in claims 1-4 and 6-8 cannot be inherent from Koivisto because the structure recited in claims 1-4 and 6-8, the relation between the center interval  $d$  between through holes and the radius  $r$  of the through holes, is completely different from Koivisto.

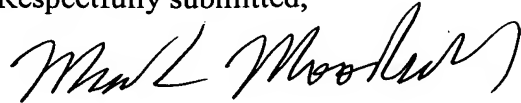
Furthermore, Koivisto and the other cited references do not describe the fundamental concept of the subject matter recited in claims 1-4 and 6-8 that "optimization of the arrangement of through holes only by the relation between radius  $r$  and center interval  $d$  irrespective of a wavelength  $\lambda$  and the like." The reasons for this optimization are described above.

For at least the foregoing reasons, it is respectfully requested that all of the prior art rejections of the claims be withdrawn.

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-4 and 6-8 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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JAO:MRW/tls

Date: June 24, 2005

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